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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,739	01/09/2002	Masayoshi Nakagawa	9281-4241	6542

7590 07/02/2003

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EXAMINER
BEACHAM, CHRISTOPHER R

ART UNIT	PAPER NUMBER
2653	13

DATE MAILED: 07/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/043,739	NAKAGAWA ET AL.	
	Examiner	Art Unit	
	Christopher R. Beacham	2653	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/29/03 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3, 6, 7, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. (hereinafter Wada) (US Patent Application 2001/0004303 A1) in view of Budde et al. (hereinafter) (US 6.233,124 B1) and further in view of Zhang (US 6,163,434).

- Regarding claim 1, Wada discloses a magnetic head actuator having a finely movable tracking device (para.0033, lines 1-5), comprising: a swing arm (main actuator in para. 0034) having a magnetic head 12a at a free end reciprocally movable around a

coarse rotation axis of a base of the swing arm (para. 0034, lines 1-3); a piezoelectric element 11 having a voltage-impressing electrode 22 (para. 0053, lines 3-9) for allowing a fine arcuate movement of the free end around the coarse rotation axis in response to an applied voltage (para. 0055, lines 6-25 and para. 0056, lines 1-6); and an FPC board 18a-c having a resin base and a feeding line (end of 18b, 22) embedded in the resin base (para. 0042, lines 9-14) for feeding power to the voltage-impressing electrode (para. 0043, lines 4-7), wherein a portion of the resin base is removed to expose a portion of the feeding line that extends onto the electrode (end of 18b touching 22; para. 0042, lines 14-18; figures 2 and 3) extending onto the voltage-impressing electrode, and wherein there is an electrical connection between the voltage-impressing electrode and the exposed portion of the feeding line (para. 0042 and 0047; figures 2 and 3).

Wada fails to disclose that there is a piezoelectric element suspended between two sections of the swing arm by adhesive and there is a direct physical connection between the voltage-impressing electrode and the exposed portion of the feeding line.

Budde teaches a piezoelectric element is suspended between two sections of the swing arm by an adhesive (col. 4, lines 3-11; figures 2 and 3).

Zhang discloses that direct physical connections between electrodes are well-known in the art (col. 3, lines 62-66).

First, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the piezoelectric element of Wada such that it is suspended between two sections of the swing arm by an adhesive, as taught by Budde.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the piezoelectric element of Wada such that it is suspended between two sections of the swing arm by an adhesive, as taught by Budde because doing so allows for efficient head positioning and large range of motion for the head (Budde; col. 1, lines 50-55). By suspending the piezoelectric component between two sections of the swing arm rather than embedding it at the end of the swing arm, longer piezoelectric elements can be used, and the amount of displacement of the head slider can be increased (Budde; col. 4, lines 3-57).

Second, it would have been obvious to one of ordinary skill in the art at the time the invention was made to connect the voltage-impressing electrode and the exposed portion of the feeding line of Wada and Budde with a direct physical connection as taught by Zhang.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to connect the voltage-impressing electrode and the exposed portion of the feeding line of Wada and Budde with a direct physical connection as taught by Zhang so that resistance change between the components can be decreased.

- Regarding claims 6 and 13, Wada and Zhang fail to disclose a pair of piezoelectric elements having polarities opposite to each other.

Budde discloses a paid of piezoelectric elements having opposite polarities (col. 4, lines 24-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the piezoelectric structure of Wada and Zhang such that it comprises a pair of piezoelectric elements having opposite polarities as taught by Budde.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the piezoelectric structure of Wada and Zhang such that it comprises a pair of piezoelectric elements having opposite polarities as taught by Budde so that with the application of a voltage, one element will expand while the other element contracts (Budde; col. 4, lines 25-36), generating a larger amount of torque in the head suspension for the same voltage when compared with a pair of electrodes having the same polarity.

- Regarding claim 7, Wada teaches a trace line 18a leading to the magnetic head and extending, together with the feeding line 18b in the FPC board (figure 2).

4. Claims 8, 10 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. (hereinafter Wada) (US Patent Application 2001/0004303 A1) in view of Zhang (US 6,163,434).

- Regarding claim 8, Wada discloses a magnetic head actuator having a finely movable tracking device (para.0033, lines 1-5), comprising: a swing arm (main actuator in para. 0034) having a magnetic head 12a at a free end reciprocally movable around a coarse rotation axis of a base of the swing arm (para. 0034, lines 1-3); a piezoelectric element 11 having a voltage-impressing electrode 22 (para. 0053, lines 3-9) for allowing

a fine arcuate movement of the free end around the coarse rotation axis in response to an applied voltage (para. 0055, lines 6-25 and para. 0056, lines 1-6); and an FPC board 18a-c having a resin base and a feeding line (end of 18b, 22) embedded in the resin base (para. 0042, lines 9-14) for feeding power to the voltage-impressing electrode (para. 0043, lines 4-7), wherein a portion of the resin base is removed to expose a portion of the feeding line that extends onto the electrode (end of 18b touching 22; para. 0042, lines 14-18; figures 2 and 3) extending onto the voltage-impressing electrode, and wherein there is an electrical connection between the voltage-impressing electrode and the exposed portion of the feeding line (para. 0042 and 0047; figures 2 and 3).

Wada fails to disclose that there is a direct physical connection between the voltage-impressing electrode and the exposed portion of the feeding line.

Zhang discloses that direct physical connections between electrodes are well-known in the art (col. 3, lines 62-66).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to connect the voltage-impressing electrode and the exposed portion of the feeding line of Wada with a direct physical connection as taught by Zhang.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to connect the voltage-impressing electrode and the exposed portion of the feeding line of Wada with a direct physical connection as taught by Zhang so that resistance change between the components can be decreased.

- Regarding claim 10, Wada discloses that the electrical connection between the magnetic head slider and the FPC feeding line comprises an Au ball bond (para. 0044, lines 1-7. Wada does not specify the means by which the piezoelectric element electrodes are connected to the FPC trace lines. The electrical connection between the FPC and the piezoelectric element is considered to comprise Au ball bonds. Assuming arguendo, the elements are connected by a means other that ball bonding.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify that the connection between the FPC feeding line and the piezoelectric element electrode of Wada comprises an Au ball bond.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to provide the connection between the FPC feeding line and the piezoelectric element electrode of Wada with an Au ball bond because Wada teaches that Au ball bonding provides adequate electrical connections between magnetic head elements and FPC lines (para. 0044).

- Regarding claim 14, Wada discloses a trace line 18a leading to the magnetic head and extending, together with the feeding line 18b in the FPC board (figure 2).

5. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. (hereinafter Wada) (US Patent Application 2001/0004303 A1) and Zhang (US 6,163,434) as applied to claim 8 above, and further in view of Pattanaik (US 5,815,347).

- Regarding claim 11, Wada and Zhang show all the features except a through hole in the exposed portion of the feeding line, wherein the electrical connection is made using a gold ball positioned in the through hole.

Wada teaches that the electrical connection between FPC feeding lines and magnetic head element electrodes is made using a gold ball (para. 0044, lines 1-7)

Pattanaik discloses a through hole 8 in a bonding section of flex cable 9 (col. 7, lines 30-40; figures 7 and 8b), wherein the electrical connection between the flex cable traces and the termination pads 5 of a magnetic head element is made using a conductive ball positioned in the through hole (col. 8, lines 21-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada and Zhang such that a through hole is provided in the feeding line, wherein the electrical connection is made using a conductor positioned in a through hole, as taught by Pattaniak.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the magnetic head actuator of Wada and Zhang such that a through hole is provided in the feeding line, wherein the electrical connection is made using a conductor positioned in a through hole, as taught by Pattanaik because a connection of this type form a very solid electrical and mechanical connection (Pattanaik; col. 9, lines 15-22), simplify the manufacturing process of the suspension, and have relaxed alignment requirements (col. 9, lines 8-10).

- Regarding claim 12, Wada and Zhang disclose an electrical connection between the exposed portion of the feeding line and the voltage impressing electrode, as explained supra.

Wada fails to teach a stud bump made of a conductive material residing on the piezoelectric element and a through hole located in the exposed portion of the feeding line.

Pattanaik discloses a stud bump 4 made of a conductive material (col. 8, line 17) residing on a electrode of a magnetic head element (col. 8, lines 21-22) and a through hole 8 located in a connection portion of the flex cable 9, wherein the electrical connection is made by positioning the stud bump in the through hole (col. 8, lines 14-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada and Zhang such that it includes a stud bump on the piezoelectric element electrode and a through hole in the FPC , as taught by Pattaniak.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the magnetic head actuator of Wada and Zhang such that it includes a stud bump on the piezoelectric element electrode and a through hole in the FPC , as taught by Pattaniak because a connection of this type results in a very solid electrical and mechanical connection (Pattanaik; col. 9, lines 15-22).

6. Claims 2 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. (hereinafter Wada) (US Patent Application 2001/0004303 A1) and Zhang (US 6,163,434) as applied to claims 1 and 8 above, and further in view of Hayden et al. (hereinafter Hayden) (US 6,019,271).

- Regarding claims 2 and 9, Wada and Zhang show all the features except the electrical connection comprises an ultrasonic bond.

Hayden teaches an electrical connection comprising an ultra sonic bond, wherein a portion of the material of the feeding line resides in the voltage impressing electrode (col. 1, 11-67)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the electrical bond of Wada and Zhang such that it the connection is an ultrasonic bond , as taught by Hayden.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the electrical bond of Wada and Zhang such that it the connection is an ultrasonic bond , as taught by Hayden, because ultrasonic bonding is frequently used in electronics to bond flex circuits to terminals (Hayden; col. 1, lines 43-49) and ultrasonic bonding tends to be less damaging to the flex circuit or component substrates than the comparable bonding methods (Hayden, col. 1, lines 55-60).

7. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. (hereinafter Wada) (US Patent Application 2001/0004303 A1), Budde et al.

(US 6.233,124 B1), and Zhang (US 6,163,434) as applied to claim 1, supra, and further in view of Pattaniak (US 5,815,347).

- Regarding claim 4, Wada, Budde and Zhang show all the features except a through hole in the exposed portion of the feeding line, wherein the electrical connection is made using a gold ball positioned in the through hole.

Wada teaches that the electrical connection between FPC feeding lines and magnetic head element electrodes is made using a gold ball (para. 0044, lines 1-7)

Pattanaik discloses a through hole 8 in a bonding section of flex cable 9 (col. 7, lines 30-40; figures 7 and 8b), wherein the electrical connection between the flex cable traces and the termination pads 5 of a magnetic head element is made using a conductive ball positioned in the through hole (col. 8, lines 21-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada, and Zhang such that a through hole is provided in the feeding line, wherein the electrical connection is made using a conductor positioned in a through hole, as taught by Pattaniak.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the magnetic head actuator of Wada, Budde and Zhang such that a through hole is provided in the feeding line, wherein the electrical connection is made using a conductor positioned in a through hole, as taught by Pattanaik because a connection of this type form a very solid electrical and mechanical connection (Pattanaik; col. 9, lines 15-22), simplify the manufacturing

process of the suspension, and have relaxed alignment requirements (col. 9, lines 8-10).

- Regarding claim 5, Wada, Budde and Zhang disclose an electrical connection between the exposed portion of the feeding line and the voltage impressing electrode, as explained supra.

Wada, Budde and Zhang fail to teach a stud bump made of a conductive material residing on the piezoelectric element and a through hole located in the exposed portion of the feeding line.

Pattanaik discloses a stud bump 4 made of a conductive material (col. 8, line 17) residing on a electrode of a magnetic head element (col. 8, lines 21-22) and a through hole 8 located in a connection portion of the flex cable 9, wherein the electrical connection is made by positioning the stud bump in the through hole (col. 8, lines 14-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada, Budde and Zhang such that it includes a stud bump on the piezoelectric element electrode and a through hole in the FPC , as taught by Pattaniak.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the magnetic head actuator of Wada, Budde and Zhang such that it includes a stud bump on the piezoelectric element electrode and a through hole in the FPC , as taught by Pattaniak because a connection

of this type results in a very solid electrical and mechanical connection (Pattanaik; col. 9, lines 15-22).

Response to Arguments

8. Applicant's arguments with respect to claims 1-14 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Beacham whose telephone number is (703) 605-4256. The examiner can normally be reached on M-F, 8: 00 am-5: 30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on (703) 305-6137. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-0377.

Christopher R. Beacham
Patent Examiner
Art Unit 2653
June 29, 2003

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